

REMARKS

Reconsideration and allowance of this application are respectfully requested. Claims 7-15 are pending, where claims 1-6 were previously canceled. By this communication claim 13 is amended.

In numbered paragraph 4 on page 2 of the Office Action, claims 7, 8, and 13 are rejected under 35 U.S.C. §102(b) for alleged anticipation by Shimizu et al (U.S. Patent No. 6,201,696). Applicants respectfully traverse this rejection.

Figures 1a through 6 illustrate Applicants' exemplary embodiments, which are directed to a power semiconductor module that includes a substrate 2 sandwiched between a bottom metallization layer 3 and a top metallization layer 4. Both the top and bottom metallization layers 3 and 4 cover only a portion of the respective surface of the ceramic substrate 2, so that first corners 24 and second corners 23 are formed by the top and bottom metallization layers, respectively. A polyamide 5 is applied in the corners 24 and in the junction between the metallization layer 4 and ceramic substrate 2 such that these gaps are filled with insulating material.

Independent claims 7 and 13 broadly encompass the aforementioned features. For example, claim 7 recites the following:

7. A power semiconductor module, comprising:
an electrically insulating substrate;
a first electrically conductive layer disposed on at least one portion of a top surface of said electrically insulating substrate, so as to selectively expose at least one peripheral top region of said electrically insulating substrate;
at least one semiconductor power chip mounted on said first electrically conductive layer;
a first electrically insulating material disposed in a corner region formed by said first electrically conductive layer and said peripheral region of said electrically insulating substrate;
a second insulating material at least partially embedding said semiconductor power chip, said electrically insulating substrate, said first electrically conductive layer, and said first electrically insulating material;

wherein the first electrically insulating material is a polyimide, and the surface of the first electrically insulating material disposed in the corner region formed by said first electrically conductive layer and said peripheral region of said electrically insulating substrate is concave-shaped.

Claim 13 recites:

13. A power semiconductor module comprising:
 an electrically insulating substrate;
 a first electrically conductive layer disposed on at least one portion of a top surface of said electrically insulating substrate, so as to selectively expose at least one peripheral top region of said electrically insulating substrate;
 at least one semiconductor power chip mounted on said first electrically conductive layer;
 a first electrically insulating material disposed in a corner region formed by said first electrically conductive layer and said peripheral region of said electrically insulating substrate;
 a second insulating material at least partially embedding said semiconductor power chip, said electrically insulating substrate, said first electrically conductive layer, and said first electrically insulating material;
 wherein the first electrically insulating material is a polyimide, and the surface of the first electrically insulating material disposed in the corner region formed by said first electrically conductive layer and said peripheral region of said electrically insulating substrate is concave-shaped,
 wherein the first electrically insulating material fills gaps in a junction between the first electrically conductive layer and said electrically insulating substrate.

The *Shimuzu* patent does not anticipate Applicants' claims because it fails to disclose every element recited therein. Under 35 U.S.C. §102, the Federal Circuit established that to properly anticipate a claim, the document must disclose, explicitly or implicitly, each and every feature recited in the claim. See Verdegall Bros. v. Union Oil Co. of Calif., 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). By the Examiner's own admission (see 4th pgph on page 5 of the Office Action), the *Shimuzu* patent does not disclose at least that the first electrically insulating material is a polyimide as recited in Applicants' claims. Rather, the *Shimuzu* patent discloses using an epoxy or polyester resin as a first electrically insulating material. In an effort to overcome this deficiency, the Examiner cites the *Nidan* publication (U.S.

Pub. 2002/0005072), for its alleged teaching that epoxy and polyimide resins are interchangeable.

While Applicants do not acquiesce to the alleged teachings of the *Nidan* publication, it remains clear that the *Nidan* publication is used to remedy a deficiency of the *Shimuzu* patent with respect to the disclosure of a polyimide resin. Stated differently, in order to reach the Examiner's conclusion, one of ordinary skill would be required to **substitute** the polyimide resin as allegedly taught in the *Nidan* publication for the epoxy resin taught in the *Shimuzu* patent. Under 35 U.S.C. §102, a substitution as such is improper, since the substitution is an explicit admission that the primary reference (the *Shimuzu* patent) fails to disclose every feature recited in the claims.

As provided in MPEP §2131.01, a 35 U.S.C. 102 rejection over multiple references has been held to be proper when the extra references are cited to:

- (A) Prove the primary reference contains an "enabled disclosure;"
- (B) Explain the meaning of a term used in the primary reference; or
- (C) Show that a characteristic not disclosed in the reference is inherent.

In this instance, none of these circumstances seemingly apply since, as noted above, the Examiner appears to cite the *Nidan* publication in an effort to remedy a deficiency of the *Shimuzu* publication with respect to Applicants' claimed polyimide resin.

For at least the foregoing reasons, Applicants' respectfully submit that the *Shimuzu* patent fails to establish a *prima facie* case of anticipation, and the

combination of the *Shimuzu* patent and the *Nidan* publication is an improper application of the references under 35 U.S.C. §102.

Regarding claim 13, and in addition to the features discussed above, the *Shimuzu* patent also fails to disclose or suggest that the first electrically insulating material fills gaps in a junction between the first electrically conductive layer and said electrically insulating substrate (see col. 12, lines 49-58).

As provided in Applicants' disclosure, the polyimide material distributes along a junction between the top metallization layer 4 and the ceramic substrate as a result of capillary forces. This characteristic of the polyimide material enables a seal to be formed between the device layers.

In contrast, the *Shimuzu* patent discloses that an epoxy or polyester resin is used as an insulating material to adhere to an AlN substrate. There is no disclosure or suggestion that the insulating material described in the reference "fills gaps in a junction between the first electrically conductive layer and said electrically insulating substrate," as recited in Applicants' claims. Because the epoxy or polyester resins do not appear to embody the features of Applicants' claimed polyimide, and more particularly, a device structure in which a polyimide fills gaps in a junction between the first electrically conductive layer and said electrically insulating substrate, the *Shimuzu* patent fails to anticipate claim 13.

Furthermore, even if the *Nidan* publication discloses the use of a polyimide resin as alleged, Applicants' respectfully submit that any hypothetical combination fails to remedy the deficiencies of the *Shimuzu* patent with respect to the claimed structural relationship recited in claim 13. For example, Applicants' claim 13 recites that the insulating material is disposed in a corner region of the first conductive layer

and a peripheral region of the insulating substrate wherein the insulating material fills gaps in a junction between the first conductive layer and the substrate. In other words, the insulating material (polyimide) creeps into any gaps between the conductive layer and the substrate. The claimed feature of the insulating material is further evidenced through other recited features. For example, claim 13 also recites that the conductive layer is disposed on a top surface of the substrate.

In contrast, the *Nidan* publication discloses that a resin member is injected into a space (volume), so that the space is filled with the resin member (see pgph [0070]). There is no disclosure or suggestion that the resin member fills gaps between a conductive layer and substrate as recited in claim 13. In fact, given the interrelationship between the device layers and the structural features described in the *Nidan* publication, Applicants respectfully submit that the reference fails to provide the requisite guidance one of ordinary skill would need to achieve a layer structure (conductive layer/insulating material (polyimide)/insulating substrate) as recited in Applicants' claims.

Therefore, withdrawal of the rejection to claims 7, 8, and 13 is respectfully requested.

In numbered paragraphs 5 and 6 on page 4 of the Office Action, claims 9-12 were identified as reciting allowable subject matter and claims 14 and 15 were identified as allowed. Applicants appreciate the Examiner's acknowledgement, and believe that claims 9-12 are allowable in their present based on the discussion above concerning independent claim 7.

Conclusion

Based on at least the foregoing amendments and remarks, Applicants submit that claims 7-15 are allowable, and this application is in condition for allowance. In the event any issues remain, the Examiner is invited to contact Applicants' representative identified below.

Respectfully submitted,

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